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Original Research Article

Pancreatico-biliary pathologies: correlation of USG and MRCP

Priyanka Ashok Khopde, Abhimanyu Kelkar*, Priscilla Joshi, Amol Bandgar, Mangal Mahajan

Department of Radiodiagnosis, Bharati Vidyapeeth Medical College and Hospital, Pune, Maharashtra, India

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***Correspondence:**
Dr. Abhimanyu Kelkar,
E-mail: Priyankakhopade58@gmail.com

ABSTRACT

Background: Obstructive jaundice is the most frequent form of hepato-biliary pathologies. The main aim is to confirm the presence of obstruction and to identify its cause, location and extent of the lesion. This study evaluated the role of USG and MRCP in hepato-biliary pathology.
Methods: Twenty-five patients of all age groups with suspicion of obstructive jaundice referred for Ultrasound were included in our study. The patients with findings suggestive of biliary obstruction underwent MRCP.
Results: Out of 25 patients, maximum patients were in the age group of 61-80 yrs. 52% were male and 48% were female. The jaundice was due to a benign etiology in 64% patients and malignant etiology in 36%. The most common benign pathology was choledocholithiasis (25%) and malignant pathology was periampullary carcinoma (44%). Overall 11 cases were inconclusive on ultrasound study while 2 cases were false positive for malignancy on MRCP. In 92% cases the correct diagnosis was detected on MRCP.
Conclusions: USG is the initial and sometimes the only imaging modality in obstructive biliary disease. However the distal CBD which is poorly seen on USG can be well evaluated on MRCP thus improving the diagnosis in pancreatico-biliary pathologies.

Keywords: Benign, Common bile duct, Magnetic resonance cholangiopancreatography, Malignant, Pancreatic duct, Ultrasound

INTRODUCTION

Obstructive jaundice is one of the most frequent form of hepato-biliary disease. In a suspected case of biliary obstruction with clinical and laboratory findings suggestive of obstructive jaundice, the main aim of radiologist is to confirm the presence of obstruction and to identify its cause, location and extent of the lesion. Current techniques for detecting biliary pathologies are trans abdominal ultrasound (USG), endoscopic retrograde cholangiopancreatography (ERCP), endoscopic ultrasound (EUS), percutaneous transhepatic cholangiopancreatography (PTC), magnetic resonance cholangiopancreatography (MRCP), helical computed tomography (hCT), and helical CT cholangiography (hCTC).[1]

Our study was done to compare diagnostic accuracy of two non-invasive modalities ultrasonography (USG) and magnetic resonance cholangiopancreatography (MRCP). Cases were followed up. The diagnosis was correlated with ERCP, surgical findings and histopathology correlation.

METHODS

This was a prospective cross sectional study, performed over a period of 15 months (August 2016 to October

2017) on 25 consecutive patients (12 women, 13 men; age range from 11 months -75 years) who presented with epigastric pain, decreased appetite, nausea, vomiting, fever with chills, yellow discoloration of skin and sclera. Patients underwent ultrasound followed by MRCP. Patients of all age groups, sex, and profession who undergo USG and MRCP with strong clinical and lab evidence of biliary obstruction were included in our study. A written informed consent was taken from the patient. The study was performed in department of Radiodiagnosis, Bharati Vidyapeeth Medical College, Pune. The study was approved by the institutional ethical committee.

Ultrasound

An Affiniti 70 ultrasound machine (Philips, Amsterdam, Netherlands) with a curvilinear probe 1-5 MHz was used. Ultrasound has always been considered the technique of first choice in the study of biliary obstructive disease. Ultrasound is non invasive, easy accessible, fast, easy to perform and less expensive. It has high sensitivity, specificity and reproducibility. However, USG is operator dependent and has a limitation in patients with obesity and gaseous distension.

Magnetic resonance cholangiopancreatography

MRCP examinations were performed based on a standardized protocol. Magnetic resonance cholangio-pancratography (MRCP) is a non invasive cross sectional MRI imaging technique for biliary system. MRCP provides high quality biliary tract images. The basic principle of MRCP is that body fluids have high signal intensity on heavily T2-weighted magnetic resonance sequences (i.e., they appear bright), whereas background tissues have low signal (i.e., they appear dark).[2]

This technique is an accurate, safe, less operator dependent, non-invasive imaging technique, which, in conjunction with MR images of abdomen, is highly sensitive and specific for the detection of biliary pathologies. It produces both high-quality, cross-sectional images of biliary system and projection images of biliary tree that are similar in appearance to those obtained by invasive radiographic methods, such as endoscopic retrograde cholangiopancreatography (ERCP), per-cutaneous trans-hepatic cholangiography (PTC) etc.[3]

Statistical analysis

The collected data was coded and entered in the Microsoft excel sheet. The diagnostic accuracy was determined using the statistic formulae.

RESULTS

In our study, out of 25 patients, 13 (52%) were males and 12 (48%) female. 48% of all patients were between 61-80 yrs of age. The cause of biliary obstruction was benign in 16 (64%) and malignant in 9 (36%). The most common cause of benign obstruction was choledocholithiasis (25%) and malignant obstruction was periampullary carcinoma (44.4%). The least common causes were pancreatic pseudocyst, a benign mass and Klatskin tumour. 11 cases were inconclusive on ultrasound, whereas 2 cases were false positive for malignancy on MRCP. MRCP was 92% accurate in diagnosing the etiology. USG had an accuracy of 56%.

Table 1: Sex distribution.

Sex	Number of patients
Male	13
Female	12
Total	25

Table 2: Distribution as per USG and MRCP diagnosis.

	Causes	USG	MRCP
Malignant	Periampullary Ca	2	3
	Pancreatic Ca	1	2
	Klatskin tumor	0	2
Benign	Benign stricture	0	3
	Choledocholithiasis	3	4
	Choledochal cyst	2	3
	Pancreatic pseudocyst	1	1
	Benign mass	1	1
	Physiological dilatation of the CBD	3	3
	Others	1	1
Inconclusive	-	11	2
Total	-	25	25

Table 3: Sensitivity of ultrasound and MRCP as compared to final diagnosis.

Modality	Accurate diagnosis	Inconclusive/ false	Accuracy
Ultrasound	14	11	56%
MRCP	23	2	92%

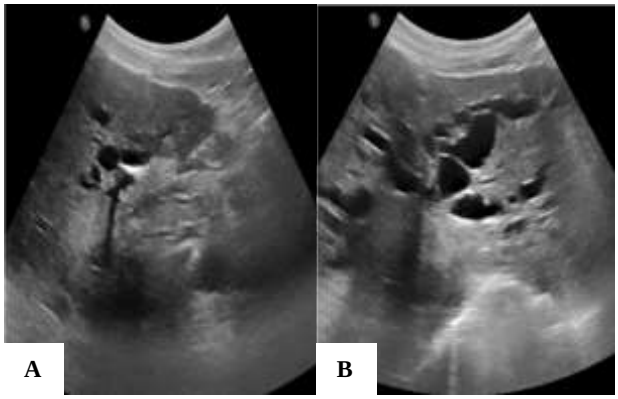

Figure 1 (A and B): IHBRD was seen on USG.

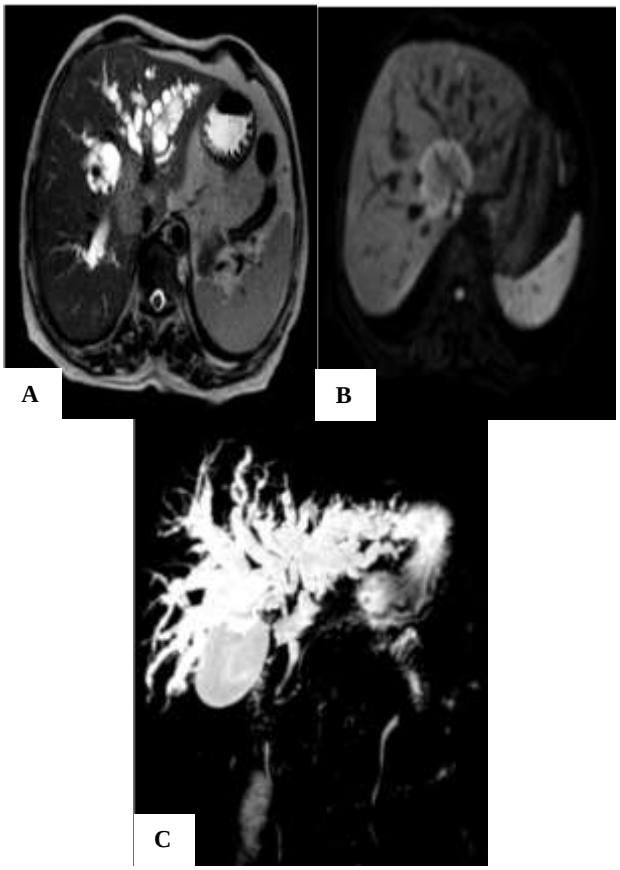

Figure 2: (A) Axial T2W, (B) Axial DWI and (C) 3D MRCP images.

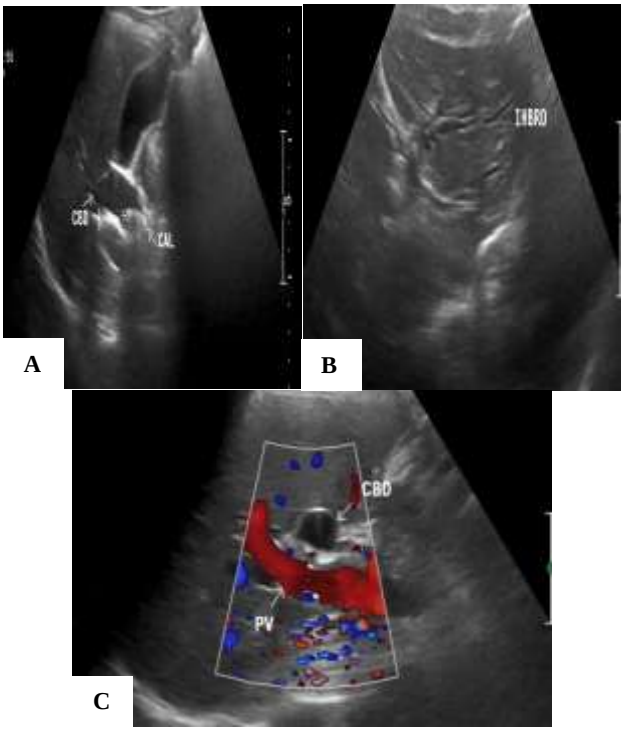

Figure 3: (A) USG reveals calculus in CBD, (B) reveal IHBR dilatation and (C) dilated CBD in transverse section.

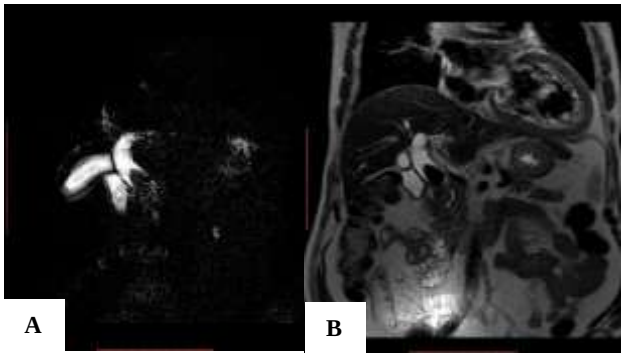

Figure 4 (A and B) Revealed 3D MRCP and coronal T2W image, distal CBD calculus causing dilatation of the proximal CBD and IHBR.

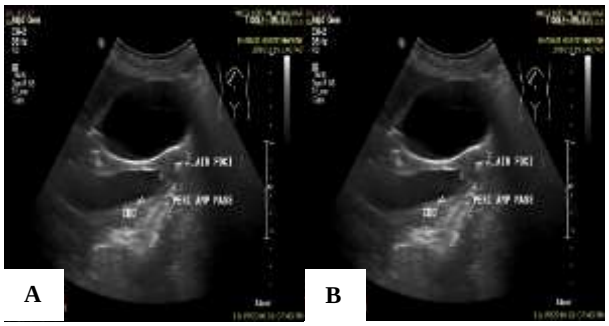

Figure 5 (A and B): USG: moderate dilatation of IHBR and CBD due to a periampullary mass.

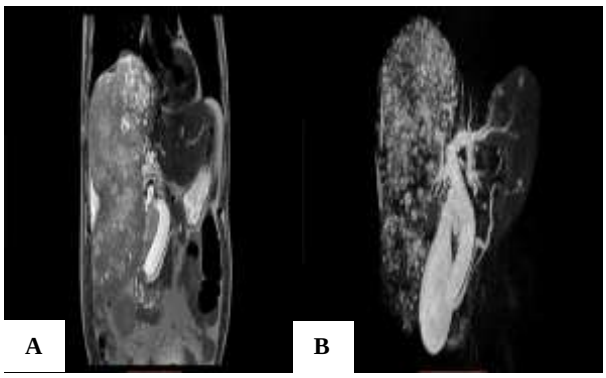

Figure 6 (A and B): 3D MRCP: confirms periampullary mass - carcinoma with liver metastasis.

DISCUSSION

A thorough knowledge of biliary anatomy and pathology is essential to evaluate a case of obstructive jaundice. Our study consisted of 25 patients. USG and MRCP were done in all the patients.

The commonest symptoms patients presented with biliary pathologies were right upper quadrant and epigastric pain, itching, yellowish discoloration of skin and sclera, nausea, vomiting, pain in abdomen (localised or diffuse) and fever with chills.

The youngest patient in our study was 11 months old and the oldest was 75 years old. Maximum number of patients was adults in the age group of 61-80 yrs and minimum number of patients was in the age group of 21-40 yrs. Our study is in concordance with that of Singh APK et al in 2015, in whose study, majority of the cases were found to be in the age group 51-60 years.[4]

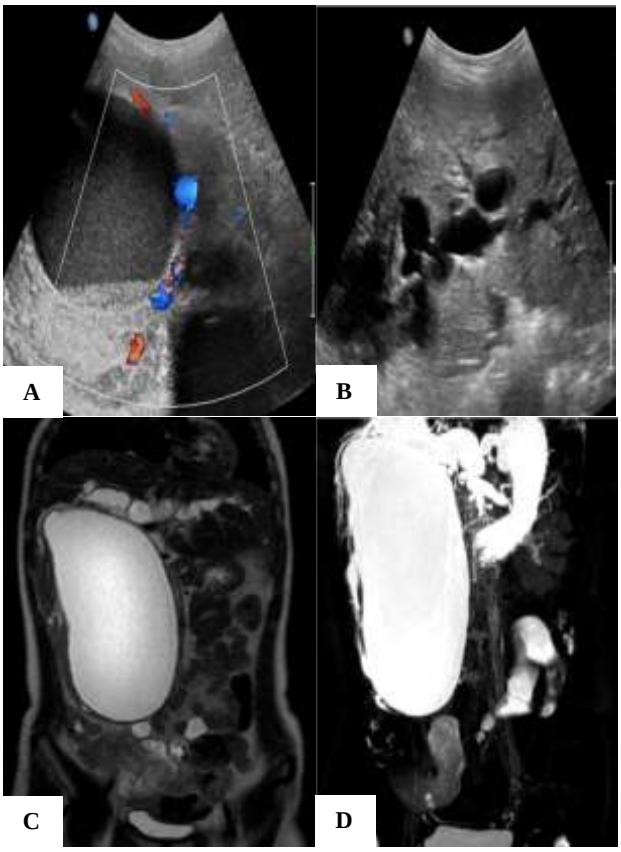

Figure 7 (A-D): On USG there was moderate dilatation of the IHBR with dilated CBD. The MRCP showed a choledochal cyst.

In our study male preponderance was seen. Our study is in concordance with that of Sutar et al 2015 who concluded that biliary obstructive diseases were found to be more common in men than in women.[5]

The most common cause for obstructive jaundice in our study was benign in 64 % of cases. Among the benign causes choledocholithiasis is the commonest (25 %). Least common causes were pancreatic pseudocyst, benign mass. Common malignant cause was periampullary carcinoma and the least common was Klatskin tumour.

There were 3 cases showing physiological dilatation of the CBD of which two were post cholecystectomy cases and one showed physiological dilatation of CBD on USG and MRCP. On MRCP, the most common malignant cause for obstructive jaundice was periampullary Ca and least common cause was cholangiocarcinoma.

On USG, it was observed that the most common malignant cause for obstructive jaundice was periampullary Ca and benign cause was choledocholithiasis. Ultrasound was inconclusive in 44%.

In imaging of benign lesions (n=16) MRCP diagnosed CBD calculi in 4 patients and USG showed the same in 3 patients. MRCP showed 100% accuracy in detecting CBD calculi. MRCP showed calculus in CBD as an area of signal void. Our study is in concordance with Munir et al in 2004 and Bhatt C et al in 2005 in their study they found that MRCP was 100 % accurate in diagnosing CBD calculus.[6,7]

MRCP clearly showed benign nature of stricture in all 3 cases approaching 100% accuracy. USG was not able to diagnose any of the strictures. Our study is in concordance with Bhatt et al and Safa Al-Obaidi et al in 2007 in whose studies they found 100% accuracy of MRCP in diagnosing benign CBD strictures.[7,8]

Among the 3 cases of the choledochal cysts, MRCP was 100 % accurate in diagnosing all the 3 cases where as USG was accurate in 2 cases (66.6 %). Our study is in concordance with Bhatt et al and Singh et al in 2015 who found 100% accuracy of MRCP in diagnosis of choledochal cysts.[4,7] MRCP and they turned out to be benign.

In 4 cases out of 9, periampullary growth was diagnosed. Amongst these 4, MRCP detected periampullary growth in 3 which were proved on subsequent histopathology. One patient was diagnosed to have periampullary growth on MRCP but on histopath, it turned out to be benign.

One case which was diagnosed as retroperitoneal mass. Nodal mass compressing the CBD turned out to be periampullary carcinoma. On USG only 2 out of 4 cases were diagnosed as periampullary carcinoma. Our study is in concordance with Kushwah et al. In their study they found 98 % accuracy of MRCP and USG in diagnosing periampullary growth.[4]

MRCP diagnose cholangiocarcinoma in 2 out of 2 cases claiming 100 % accuracy while USG only showed intrahepatic biliary dilatation in these patients. Siva Prasad et al found that USG and MRCP was 80 % and 100 % in diagnosing cholangiocarcinoma.[2]

In 3 cases of pancreatic carcinoma, MRCP diagnosed 2 cases (66.6%) accurately. In one MRCP showed a distal CBD stricture which turned out to be pancreatic carcinoma on histopathology. Only one of the 3 cases was diagnosed by USG. On MRCP one of the case was falsely diagnosed as pancreatic carcinoma which turned out negative for malignancy on histopathology correlation. Diwanji et al in 2016 correctly diagnosed pancreatic carcinoma by MRCP (100%).[9] In a control study in 2003 done by Zhong et al, they found that USG

and MRCP was 63% and 90% accurate in diagnosing of pancreatic head carcinoma.[10]

USG is the modality of initial evaluation in biliary obstruction, whereas MRCP gives a better diagnosis with less false positive. USG has inherent drawbacks and limitations which compromise diagnostic accuracy in lower CBD obstructions.[7]

MRCP is much more accurate in diagnosing CBD and pancreatic duct pathologies and it helps in deciding further management. It guides the surgeon doing ERCP and thus cuts down the rate of 'negative' ERCP.[11] MRCP has shown similar findings to that of ERCP in patients with suspected biliary obstruction. In patients in whom an endoscopic procedure is not possible (previous biliary enteric anastomosis, previous partial gastrectomy etc.), MRCP is the best diagnostic tool.[12]

In our study, MRCP had highest accuracy of 92% whereas USG had 56 % accuracy in diagnosis of hepato-biliary and pancreatic pathologies.

CONCLUSION

Our study showed that MRCP was the better non-invasive modality in pancreatico-biliary pathologies than ultrasound.

MRCP is non-invasive, radiation free technique for accurate assessment of the pancreatico-biliary tree. MRCP is capable of multiplanar imaging and 3D reconstruction. Ultrasound is a non-invasive, radiation free modality. It is less expensive, easily available, requires less time.

MR cholangiopancreatography is very accurate in demonstrating the length of stricture and it is able to differentiate malignant from benign strictures. Benign strictures have smooth tapered margins, whereas malignant strictures show abrupt cut off and irregularity of the narrowed segment with or without shouldering. MRCP along with axial and coronal imaging is able to detect the exact location and extent of malignant tumours and helps the surgeon for further workup and operative planning. MRCP has the potential to replace or limit the use of invasive procedures like diagnostic ERCP. It shows the entire biliary tract proximal as well as distal to obstruction and it is an excellent investigation prior to the laparoscopic biliary procedures.

MRCP, due to its diagnostic accuracy, has a potential to replace or limit the use of invasive procedures like diagnostic ERCP. Endoscopic retrograde cholangio-pancreatography (ERCP) helps to characterize the stricture by providing tissue samples.

Advantages of MRCP over ultrasound

- Provides high-resolution images of biliary tree.
- Can be used in obese patients, children and those patients who are poor sonographic candidates.
- All the biliary pathologies can be evaluated with MRCP and gadolinium contrast T1W imaging can attain additional information.
- MRCP has high sensitivity in detecting fluid collections in the pancreatic region as compared to other imaging modalities.
- It is highly useful in postoperative patients of biliary-enteric anastomosis which are difficult to evaluate on CT/Ultrasound.

Limitations of the study

- Expensive
- Claustrophobia
- If no therapeutic and interventional procedures could be carried out
- Breath holding is difficult in elderly, children.
- Time consuming.

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REFERENCES

1. Bhargava SK, Usha T, Bhatt S, Kumari R, Bhargava S. Imaging in obstructive jaundice: A review with our experience. JIMSA. 2013;26:12-4.
2. Siva Prasad A, Sandeep J. Ultrasound and magnetic resonance cholangio-pancreatography correlation in biliary disorders. MRIMS. 2015;3(2).
3. Kim JH, Kim MJ, Park SI, Chung JJ, Song SY, Yoo HS, Lee JT. Using kinematic MR cholangiopancreatography to evaluate biliary dilatation. American J Roentgenol. 2002;178(4):909-14.
4. Kushwah AP, Jain S, Agarwal R, Tomar SP. Biliary tract obstructive diseases: a comparative evaluation by ultrasonography and magnetic resonance cholangiopancreatography (magnetic resonance imaging). Int J Sci Study. 2015;3(4):149-53.
5. SuthaR M, PuRohit S, BhaRgaV V, Goyal P. Role of MRCP in differentiation of benign and malignant causes of biliary obstruction. JCDR. 2015 Nov;9(11):TC08.
6. Munir K, Bari V, Yaqoob J, Khan DB, Usman MU. The role of magnetic resonance cholangiopancreatography (MRCP) in obstructive jaundice. J Pak Med Assoc. 2004;54(3):128-32.
7. Bhatt C, Shah PS, Prajapati HJ, Modi J. Comparison of diagnostic accuracy between USG and MRCP in biliary and pancreatic pathology. Indian J Radiol Imaging. 2005;15(2):177.
8. Al-Obaidi S, Al-Hilli MR, Fadhel AA. The role of ultrasound and magnetic resonance imaging in the diagnosis of obstructive jaundice. Iraqi Postgrad Med J. 2007;6(1):7-17.
9. Diwanji N, Dibbad RB, Sastri M, Desai E. The study of role of magnetic resonance cholangio-pancreatography (MRCP) in pancreato-biliary disorders. Int J Med Sci Public Health. 2016;5(12):2635-40.
10. Zhong L, Yao QY, Li L, Xu JR. Imaging diagnosis of pancreato-biliary diseases: a control study. World J Gastroenterol. 2003;9(12):2824.
11. Nirhale DS, Kulkarni GC, Shingade P, Chavan S, Sonawane T, Dhende M. Role of magnetic resonance cholangiopancreatography in diagnosing pancreatobiliary pathologies: a prospective study. Int Surg J. 2018;5(6):2233-7.
12. Adamek HE, Albert J, Breer H, Weitz M, Schilling D, Riemann JF. Pancreatic cancer detection with magnetic resonance cholangiopancreatography and endoscopic retrograde cholangiopancreatography: a prospective controlled study. Lancet. 2000;356(9225):190-3.

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